Endoscopic Tympanoplasty And Microscopic Tympanoplasty: A Comparative Analysis.

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***Abstract*- Aim:** This study was conducted to compare the results of endoscopic and microscopic tympanoplasty.
Methods: This was a retrospective comparative study conducted by the depth. of ENT HNS at SHKM GMC Mewat from January 2015 to January 2016.73 patients who underwent type I tympanoplasty were classified into two groups; endoscopic tympanoplasty (ET, n=25), microscopic tympanoplasty (MT, n=48). Pure tone audiometric results preoperatively and 3 months postoperatively, operation time and graft success rate were evaluated.
Results: Mean operation time of MT (88.9±28.5 minutes) was longer than that of the ET (68.2±22.1 minutes) with a statistical significance (P=0.002). Graft success rate in the ET and MT group were 92% and 95.8%, respectively; the values were not significantly different (P=0.304). Pre- and postoperative audiometric results including bone and air conduction thresholds and air-bone gap were not significantly different between the groups. In all groups, the post- operative air-bone gap was significantly improved compared to the preoperative air-bone gap.
Conclusion:. With endoscopic system, minimal invasive tympanoplasty can be possible with similar graft success rate.

***Index Terms*-** Endoscopy; Tympanoplasty.

I. INTRODUCTION

Since the introduction of tympanoplasty in the 1950s [1], variety of surgical techniques have been developed for closure of tympanic membrane perforation. Temporalis fascia is the most widely used materials with reported success rates of around 80% to 90% in patients who undergo primary tympanoplasty with a microscopic approach [2]. Postauricular skin incisions is the most widely used approach for microscopic tympanoplasty. This conventional procedure results in surgical scar and significant pain to the patient. Minimally invasive otologic surgery has recently been developed along with endoscopic techniques [3]. Endoscopic ear surgery has become popular nowadays[4]. Advantages of endoscopic ear surgery compared to the conventional microscopic surgery include avoiding endaural and postauricular incisions, minimal soft tissue dissection and angled view avoiding bone dissection[5,6]. Transcanal approach is the most commonly used approach for endoscopic tympanoplasty. Endoscopic approach has resulted in decreased incidence of residual and recurrences during surgeries for cholesteatoma removal [5,7-9]. The value of endoscopes combined with the conventional microscopic eradication of cholesteatoma has been well established [6-15].However, endoscopic surgery has several disadvantages which include one hand technique, difficulty during bleeding and risk of thermal damage.[17,18].

This study has been conducted to compare the success results of endoscopic tympanoplasty with microscopic tympanoplasty with success being defined as improvement in hearing and closure of tympanic membrane perforation. In addition operation time for microscopic and endoscopic tympanoplasty was also evaluated.

II. MATERIALS AND METHODS

This retrospective study was conducted by the department of ENT HNS at SHKM GMC Mewat from January 2015 to January 2016.The study enrolled 73 patients aged 23 to 87 years (mean, 54.0±12.2 years) who underwent tympanoplasty type I . All patients had endoscopic examination, pure tone audiometry, and temporal bone computed tomography as preoperative work-up and had postoperative follow-up with endoscopic examination and pure tone audiometry at 3 months after surgery. Mean follow-up was 6.4 months (range, 3 to 11 months). Patients were classified into two groups according to type of surgery: endoscopic tympanoplasty (ET) and microscopic tympanoplasty (MT). Postaural was the approach used for microscopic surgery “figure1” and transcanal for endoscopic procedure “figure 2”.Tympanoplasty type I procedures were performed in all patients. In the MT group Carl Zeiss was used and in the ET group, an endoscopic system (Karl Storz) and 0- or 45-degree rigid endoscopes (4.0-mm diameter,16 cm long) were used. Temporalis fascia was the graft used in both groups and postoperatively EAC was packed with Gelfoam. Pre- and postoperative audiometric parameters were compared using paired t-tests. Statistical significance was accepted at $P<0.05$.
Patients with other than central perforation, wet ear, cholesteatoma, ossicular erosion or fixation and other medical illness like COPD were excluded from the study.

FIGURE 1: POSTAURICULAR APPROACH

FIGURE 2: TRANSCANNAL APPROACH

III. RESULTS

The demographic data and the clinical findings of each group (ET, n = 25; MT, n = 48) are presented in Table 1.

Table 1:Comparision between MT and ET groups.

Variables	Overall(n=73)	ET(n=25)	MT(n=48)	P-value
Age(yr)	54.0 +/- 12.2	54.4+/-11.7	53.7+/-12.6	0.810
Operation Time (min)	81.8+/-28.1	68.2+/-22.1	88.9+/-28.5	0.002
Graft Success rate	71(97.3)	23(92)	46(95.8)	0.304
PTA-preoperative				
Bone	26.6+/-16.2	23.9+/-16.9	28.0+/-15.8	0.174
Air	45.2+/-18.1	42.7+/-19.7	46.5+/-17.3	0.276
Air-Bone gap	18.7+/-7.3	18.9+/-7.8	18.6+/-7.1	0.995
Air-Bone gap(dB)				
Preoperative	18.7+/-7.2	18.9+/-1.6	18.6+/-1.0	0.877
Postoperative	11.3+/-8.6	9.2+/-1.4	12.5+/-1.3	0.120
P-value	<0.001	<0.001	<0.001	
Bone conduction (dB)				
Preoperative	26.6+/-16.2	23.9+/-16.9	28.0+/-15.8	0.174
Postoperative	27.8+/-18.1	29.9+/-19.6	29.8+/-18.5	0.105
P-value	0.098	0.221	0.342	

Mean ages were 54.4±11.7 years (ET) and 53.7±12.6 (MT). The ages did not differ significantly. Preoperative audiometric tests including bone and air conduction, and air-bone gap were not significantly different between the two groups (*P* = 0.174,

0.277, and 0.995, respectively). Mean operation time of the MT group (88.9±28.5 minutes) was significantly longer than the ET group (68.2±22.1 minutes) (P = 0.002). Graft success rate in the ET and MT group was 92% and 95.8%, respectively, which was not statistically significantly different (P= 0.304). Preoperative audiometric parameters including bone conduction, air conduction, and air-bone gap were not significantly different between ET and MT group (P=0.174, P=0.276, and P= 0.995, respectively). Pre- and postoperative air-bone gap was analyzed with paired *t*-test separately in each group. In the ET group, the pre- and postoperative air-bone gap was 18.9±1.6 dB and 9.2±1.4 dB, respectively, which was a significant improvement (P<0.001). The respective values in the MT group (18.6±1.0 dB and 12.5± 1.3 dB) also represented a significant (P<0.001). Bone conduction preoperatively and 3 months postoperatively were compared using the paired *t*-test in each group to evaluate inner ear damage. All groups had no significant difference between pre- and postoperative bone conduction (ET, 23.9± 16.9 vs. 29.9±19.6 dB, P=0.221; MT, 28.0±15.8 vs. 29.8± 18.5 dB, P = 0.342). In the ET group, bone conduction hearing level was 25.8±21.9 dB preoperatively and 28.2±20.3 dB at 3 months postoperatively. There was no significant changes in the ET group (P = 0.200). Otherwise, there was significant aggrava -tion of bone conduction in the MT group (P = 0.004). Preoperative bone conduction of the MT group was 30.5±21.0 dB and postoperative bone conduction was 37.4±22.8 dB.

IV. DISCUSSION

Rigid endoscopes have been used initially for myringoplasty and as an adjuvant to microscopic mastoidectomies. However nowadays the use of endoscope in ear surgery is increasing and include middle ear tumor, ossiculoplasty, tympanoplasty, and cochlear implantation [17]. Several meta-analyses and review articles of endoscopic ear surgery support the safety of the approach, with minimal morbidity evident [15,17,21]. Since endoscopic technique is minimally invasive and has the advantage of angled view thus it can avoid mastoidectomies, external incisions, and soft tissue dissection in selected cases as compared with the conventional microscopic approach [9,13,14,17]. In addition, endoscopic view offers a better chance of education to trainees. However, endoscopic surgery has several disadvantages which include one hand technique, difficulty during bleeding and risk of thermal damage.[17,18]. In spite of the one-handed nature of the endoscopic surgery, the current data indicate that endoscopic tympanoplasty can be successfully performed by an experienced surgeon. The endoscopic group had significantly shorter operation time than the microscopic tympanoplasty group[16]. Studies have shown significant hearing improvement after endoscopic ear surgeries[16,23]. Similarly, significant improvements of air-bone gap after endoscopic tympanoplasty were found presently.

The endoscopic system has been used for second-look procedures or primary resection of middle ear cholesteatoma. Advantages include clear observation of middle ear cavity, low recurrence rate, prevention of a retraction pocket, and preservation of ossicles [9,11,13,24].

We achieved a graft success rate of 92% at 3 months, with no recurrence of otorrhea at 3 months after endoscopic tympanoplasty. Therefore, we suppose that the endoscopic technic could be helpful for eradication of pathologic process- es in the middle ear, such as granulation tissue or adhesion, as well as cholesteatoma.

In summary, the endoscopic technique is a minimally invasive technique with less operative time and success rate similar to microscopic surgery. However it is a one handed technique and needs more training as compared to conventional method.

V. CONFLICT OF INTEREST

None

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